Application No.: 10/682,154

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A tunnel-injection device, comprising:

a reception layer made of a first semiconductor;

a barrier-forming layer made of a second semiconductor having a bandgap-narrower than the first semiconductor, being in metallurgical contact with the reception layer so as to form a heterojunction interface;

a gate insulating film disposed on the barrier-forming layer contacting to the heterojunction interface;

a gate electrode disposed on the gate insulating film configured to control the width of the barrier generated at the heterojunction interface between the reception layer and the barrier-forming layer so as to change the tunneling probability of carriers through the barrier;

a ~~carrier-receiving~~ drain region made of the first semiconductor, being ~~contact~~ contacted with the reception layer, configured to receive the carriers injected by tunneling through the barrier; [[and]]

a carrier-supplying region made of the second semiconductor, being ~~contact~~ contacted with the barrier-forming layer, configured to supply the carriers to the barrier-forming layer; and

a source electrode being contacted with the carrier-supplying region.

Claims 2-3 (Cancelled)

4. (Withdrawn) The tunnel-injection device of claim 2, wherein conductivity type of the carrier-supplying region is same as the barrier-forming layer.

5. (Withdrawn) The tunnel-injection device of claim 2, wherein impurity-doping level of the carrier-supplying region is higher than the barrier-forming layer.

6. (Currently Amended) The tunnel-injection device of claim 1, wherein the reception layer comprises;

a heavily doped region being metallurgical contacting with the barrier-forming layer; and

a drift layer having impurity-doping level lower than the heavily doped region, being in metallurgical contact with the heavily doped region, configured to transport the carrier to the ~~carrier receiving~~ drain region.

7. (Original) The tunnel-injection device of claim 1, wherein the carrier-supplying region being stacked on the barrier-forming layer.

8. (Original) The tunnel-injection device of claim 1, wherein the carrier-supplying region and the barrier-forming layer are laminated on the top surface of the reception layer, in a substantially same planar level.

9. (Original) The tunnel-injection device of claim 1, wherein gate insulating film contacts with the top surface of the reception layer in a window part of the barrier-forming layer being laminated on the top surface of the reception layer.

10. (Original) The tunnel-injection device of claim 1, wherein gate insulating film contacts with the top surface of the reception layer in a window part of the barrier-forming layer being buried in the reception layer.

11. (Original) The tunnel-injection device of claim 10, wherein the carrier-supplying region is buried in the barrier-forming layer so that the gate insulating film can cover simultaneously the top surfaces of the reception layer, the barrier-forming layer and the carrier-supplying region.

12. (Original) The tunnel-injection device of claim 1, wherein gate insulating film is spatially isolated from the top surface of the reception layer by the barrier-forming layer being laminated on the top surface of the reception layer.

13. (Original) The tunnel-injection device of claim 12, wherein gate insulating film contacts with the top surface of the barrier-forming layer in a window part of the carrier-supplying region being laminated on the top surface of the barrier-forming layer.

14. (Original) The tunnel-injection device of claim 12, wherein gate insulating film cover both the top surface of the barrier-forming layer and the top surface of the carrier-supplying region in a substantially same planar level.

15. (Withdrawn) The tunnel-injection device of claim 1, wherein the carrier-supplying region comprises the first semiconductor.

16. (Withdrawn) The tunnel-injection device of claim 15, wherein the carrier-supplying region is buried in the reception layer.

17. (Withdrawn) The tunnel-injection device of claim 16, wherein the barrier-forming layer cover simultaneously the top surfaces of the reception layer and the carrier-supplying region.

18. (Withdrawn) The tunnel-injection device of claim 16, further comprising a body region made of the first semiconductor having an opposite conductivity type of the reception layer, wherein the carrier-supplying region is disposed on the body region.

19. (Withdrawn) The tunnel-injection device of claim 16, wherein the carrier-supplying region serves as a source region of the insulated gate transistor.

20. (Currently Amended): A method for fabricating a tunnel-injection device, comprising:

preparing a base body made of a first semiconductor;

growing a layer made of a second semiconductor having a bandgap-narrower than the first semiconductor on a surface of the base body so as to form a heterojunction interface;

doping first impurity atoms in the layer so as to form a barrier-forming layer made of the second semiconductor;

doping selectively second impurity atoms with heavier doping level than the barrier-forming layer so as to form a carrier-supplying region made of the second semiconductor, configured to supply carriers to the barrier-forming layer;

depositing a gate insulating film on the barrier-forming layer so as to contact with the heterojunction interface; [[and]]

forming a gate electrode on the gate insulating film, the gate electrode is configured to control the width of the barrier generated at the heterojunction interface between the base body and the barrier-forming layer so as to change the tunneling probability of carriers through the barrier; and

forming a source electrode on the carrier-supplying region.

21. (Original) The tunnel-injection device of claim 1, wherein the first semiconductor is made of SiC.

22. (Original): The tunnel-injection device of claim 1, wherein the second semiconductor is selected from the group consisting of single crystalline silicon, polysilicon and amorphous silicon.

23. (Currently Amended): A tunnel-injection device having source and drain electrodes, comprising:

means for forming a heterojunction interface so as to generate a band-edge discontinuity barrier at the heterojunction interface ~~of the heterojunction~~;

means for supplying carriers so as to accumulate the carriers at the heterojunction interface ~~of the heterojunction~~, being contacted with the source electrode;

means for applying electric field to the band-edge discontinuity barrier so as to change the tunneling probability of the carriers through the band-edge discontinuity barrier; and

means for receiving carriers injected through the band-edge discontinuity barrier by tunneling, being contacted with the drain electrode[[;]].